

# Significant Digits

- When communicating in science you need to be able to express certainty. There is an international agreement about the correct way to record measurements. Record all certain digits plus one.
- How do we decide which digits are significant?
- [http://www.physics.uoguelph.ca/tutorials/sig\\_fig/SIG\\_fig.htm](http://www.physics.uoguelph.ca/tutorials/sig_fig/SIG_fig.htm)

# How many sig digs in each number?

- 357
- 2500
- 25.0
- 0.073
- 0.0730
- $2.036 \times 10^{-3}$

# Round Each Number to the Requested Number of Sig Digs

5.90354 to 3 sig digs

425 to 1 sig dig

425 to 2 sig digs

0.0352190 to 4 sig digs

# Adding and Subtracting

- When adding and subtracting measured values of known precision, the answer has the same number of decimal places as the measured value with the fewest decimal places.

Example:

$$13.5 + 2.83 =$$

$$0.0498 + 0.05 =$$

$$1.253 + 8.5496 =$$

# Multiplying and Dividing

- When multiplying and or dividing the answer has the same number of significant digits as the measurement with the fewest number of significant digits.

Example:

$$25 \times 3.05 =$$

$$5.75 \times 10 =$$

$$120 \times 11 =$$

# Counted and Defined Values

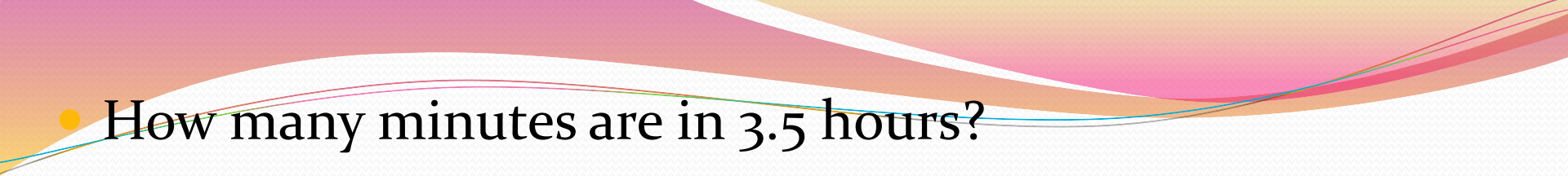
- Counted and defined values are EXACT numbers and we don't include them when considering significant digits

## Counted values

4 dogs  
10 CDs  
3 Blue Jays

## Defined values

1000 m in a 1 km  
10 mm in a 1 cm  
60 minutes in 1 hour

- 
- How many minutes are in 3.5 hours?
  - How many hours in 14 days?
  - How many weeks in 43813 days?



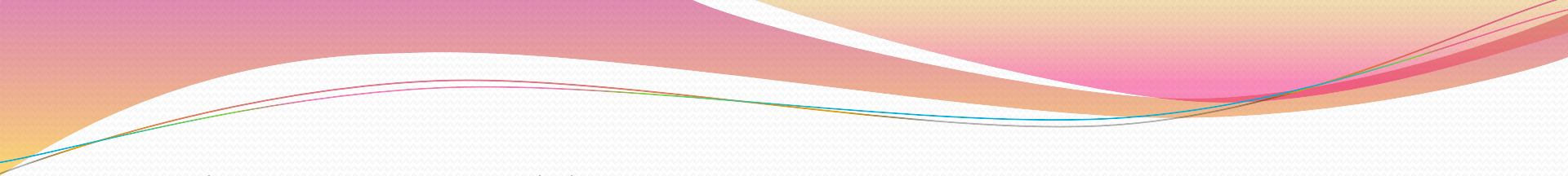
- How many seconds in 32 days?

- How many minutes in 2 weeks?

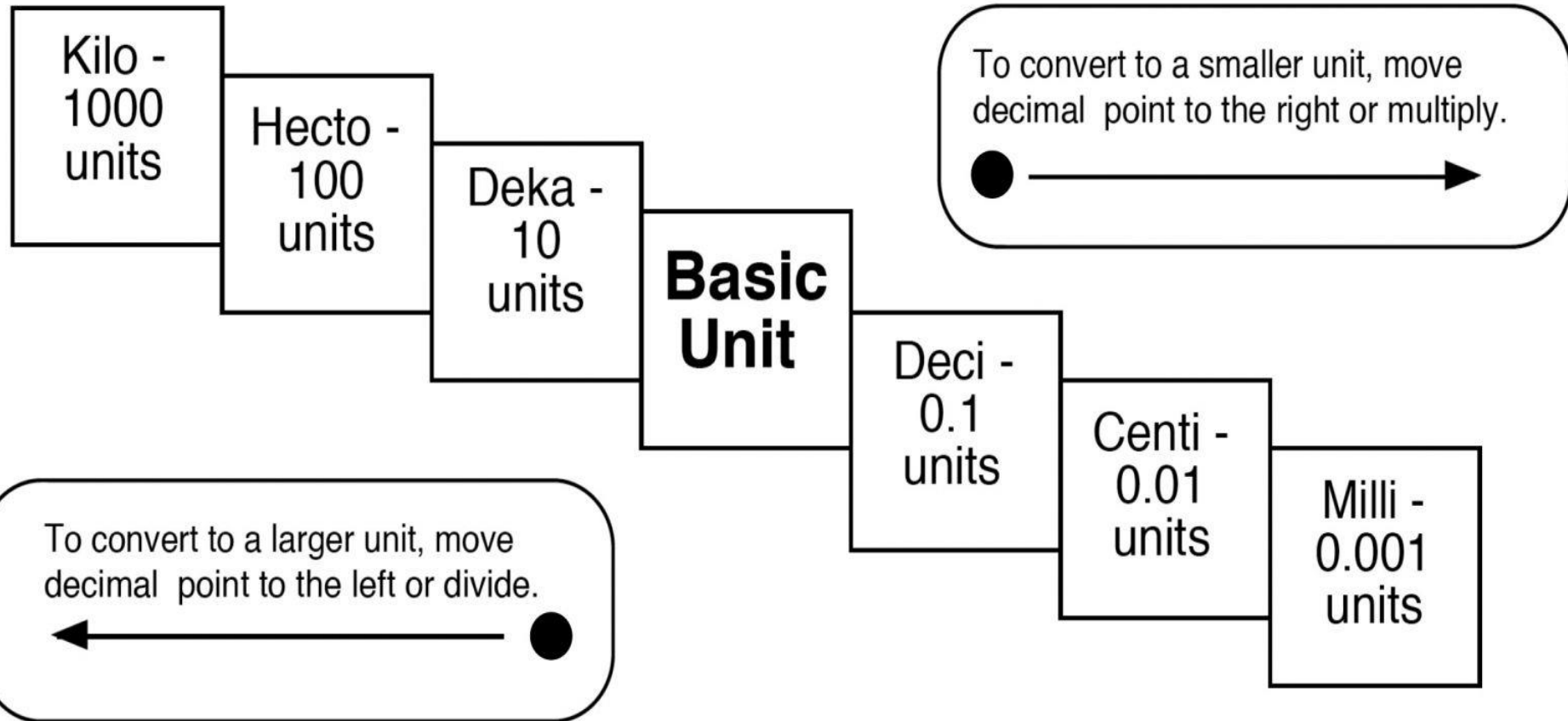


# Measuring Distance

- We use “metres” as the base unit for measuring distance in physics.
- It is not always practical to measure distances using “metres”
  - Example: would you use a metre to describe how long a pencil is? What might you use instead?
- Centimetres, millimetres, kilometres

- 
- What units would you use to measure:
    - The distance between here and St. Andrews?
    - The width of a dime?
    - The length of my classroom?
    - The height of a calculator?

# Metric Conversion Chart





- 10 cm is how many:

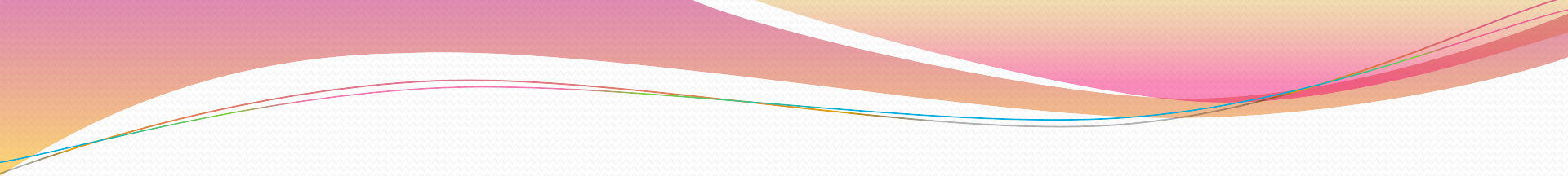
- Metres?

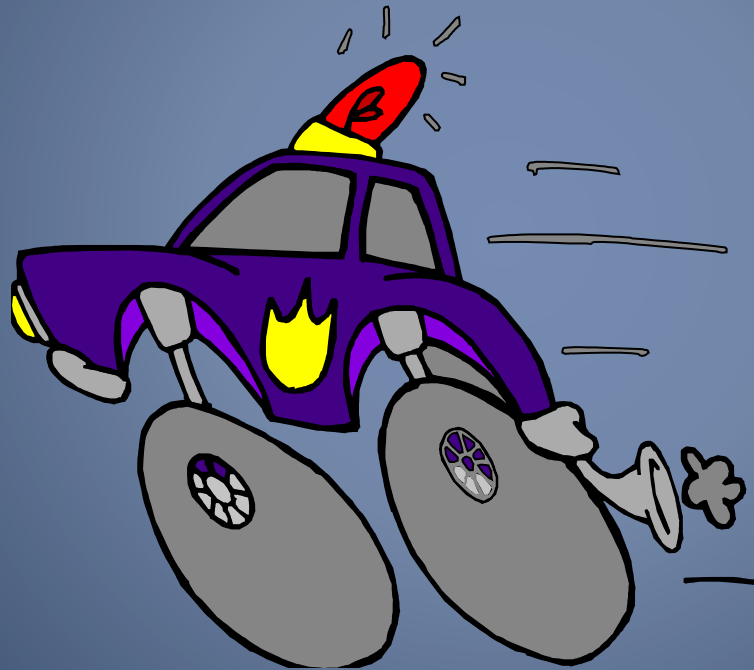
- Kilometres?

- Millimetres?

# Rearranging Formulas

- $A = \frac{bh}{2}$
- Solve for “b”

- 
- $a = \frac{F}{m}$
  - Solve for F
  - Solve for m

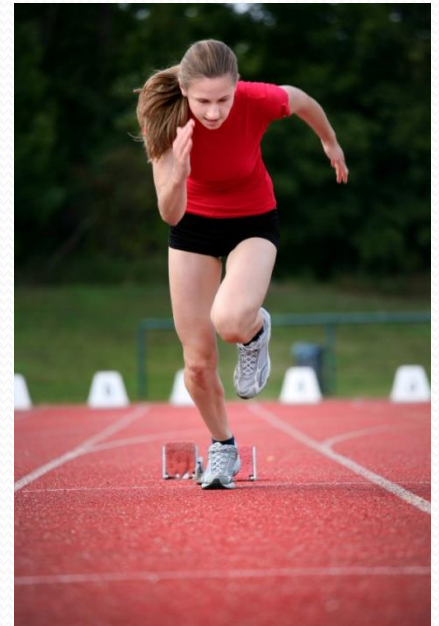


# Motion

Science 10

# Speed

- If 2 people are running a 100 m race, explain how you would know that one person has won.
- What is the distance that they covered?
- How does time affect who won?
- What is speed?





# Speed

Speed = distance object moves  
time it takes

$$S = \frac{d}{t}$$

\*usually expressed in meters (m)  
second (s)

or

kilometers (km)  
hour (hr)

# Speed

- Do you think that runners in a race go the same speed over the entire distance?
- Why do we represent their speed with one number (i.e. 5 m/s)?



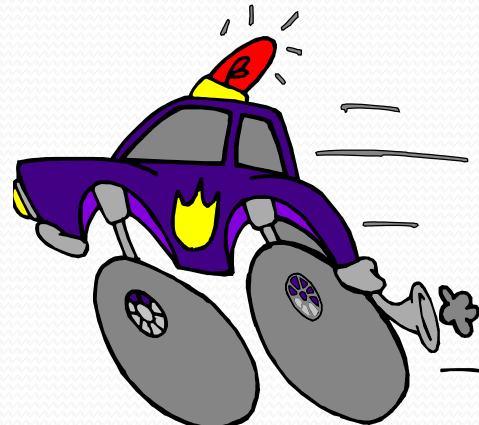


# Average Speed

- The number we often use to represent the speed of an object is called average speed.
- Explain why you think scientists' call this speed “average speed”.

# Average Speed vs. Instantaneous

- Average speed is a measure of the average distance covered in 1 unit of time (i.e. 1 s, or 1 hr) for the entire distance.
- Instantaneous speed is a measure of the speed of an object in the instant it is measured - like a police radar measures.



# Rearranging Speed Equation

- $v$  – velocity (speed),  $d$  – distance,  $t$  – time

- $$v = \frac{d}{t}$$

- $$d = v \times t$$

- $$t = \frac{d}{v}$$

# Example:

- A car travels 125 km in 2 hours. What is the average speed of the car?

# Example:

- Miss Nordstrom's cat can run 100.0 metres in 8.75 seconds. What is the speed of her cat?

# Example:

- Harley is travelling on a bus for football. The bus travels at a speed of  $110 \text{ km/h}$  for  $4.5$  hours. How far did Harley travel?



# Example:

- Moncton is 247 km away. The speed limit the entire way is 110 km/h. How many hours does it take to get there? How many minutes is this?

# Example:

- Miss Nordstrom runs  $7.75 \text{ m/s}$  for 3 minutes. How far did she run?

# Graphs

- Help communicate information to others regarding a number of variables.
- Have independent variables and dependant variables which create an x and y axis.
- Help demonstrate the relationship between variables like distance, time and velocity
- <http://graphs.mathwarehouse.com/distance-time-graph-activity.php>
- What is represented in this graph?

# Slope and speed

- The greater the slope of the line created on a distance time graph the greater the speed (velocity).
- How would you draw the distance time graph for:
  - Bicycle
  - Roller blades
  - Walking

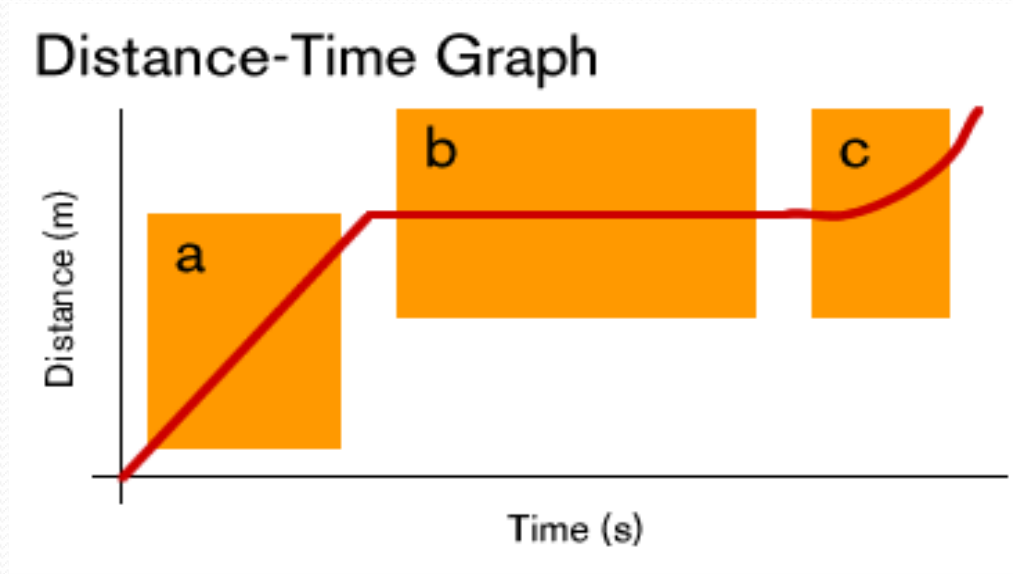
# Slope

- created by the distance time graph is represented by rise of the graph divided by the run of the graph. This equation is also represents velocity.
- Slope = rise divided by run on a distance time graph
- $S = \text{rise} / \text{run}$

# Summary

- In summary the speed of an object in motion can be determined from the slope of a distance time graph.
- Read section 9.7 pages 362-365
- Answer the Understanding Concepts questions page 365

# Section 9.7 – Distance-Time Graphs



1. What is this graph describing?
2. How does distance from the starting point change as time changes for the intervals a, b & c?

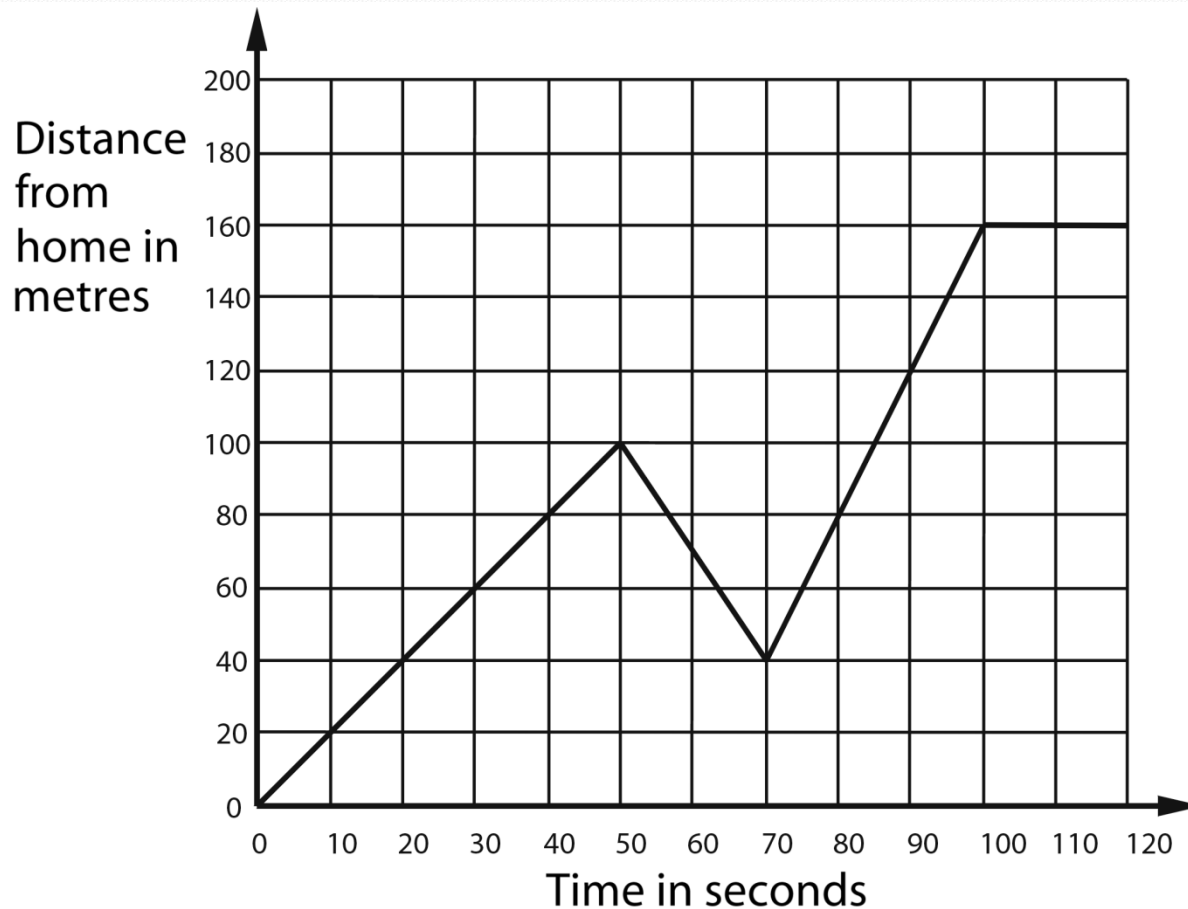
# Distance-Time Graphs – Card Game

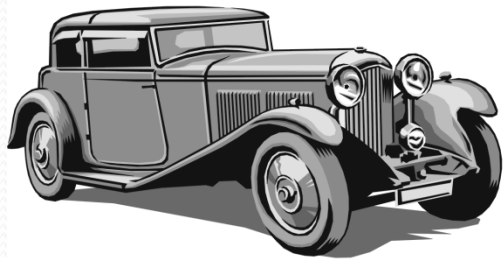
Show me a distance–time graph for:

1. a car travelling at a steady speed;
2. a car speeding up;
3. a car slowing down;
4. a stationary car;
5. two cars travelling at the same speed towards each other;

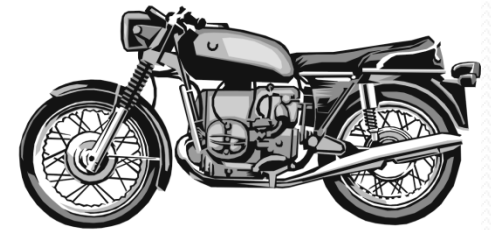
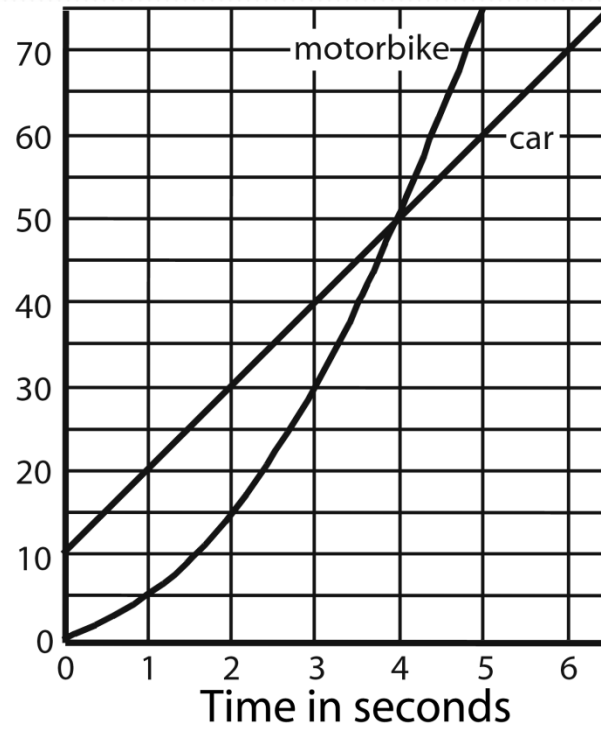


# Distance-Time Graphs – Stories

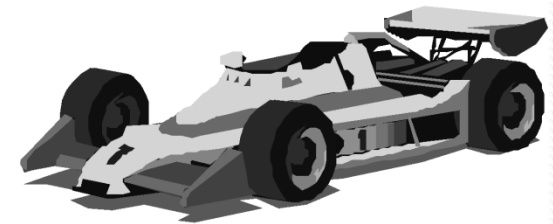
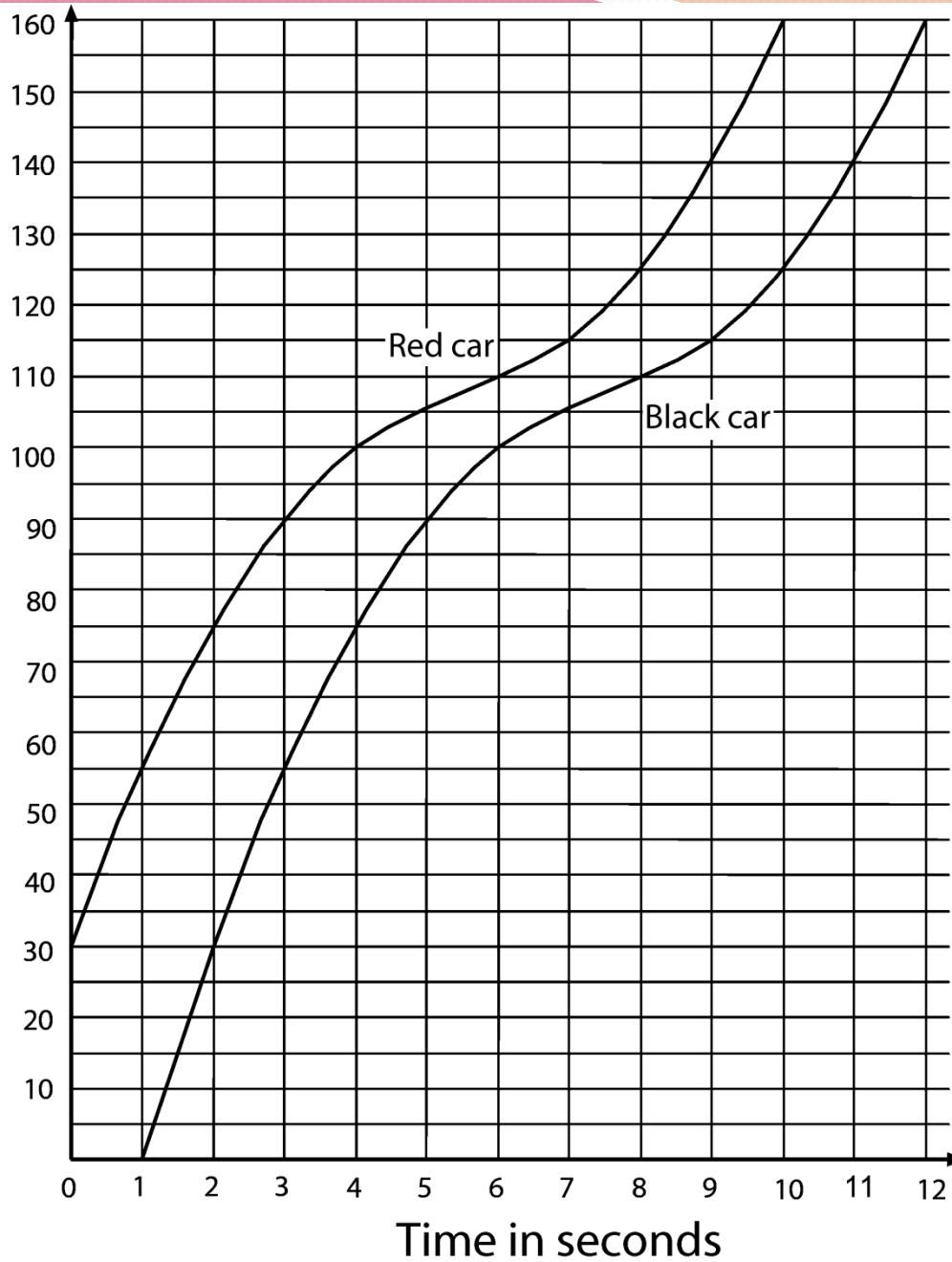




Distance  
along the  
road in  
metres



Distance  
along the  
track in  
metres



# Distance-Time Graphs – Card Game

Show me a distance–time graph for:

6. a car is crawling along in the slow lane and a car overtakes
7. very quickly;
8. a child runs into the road, so the driver has to make an emergency stop;
9. a car slows down as it goes over a speed bump, then goes quickly again.

Worksheet

# Section 9.7 – Distance-Time Graphs

- Graphing Activity & Simulation

# Acceleration

- The change in velocity over a period of time.

$$a = \frac{\Delta V}{\Delta t}$$

$$\text{units} = \frac{\text{m}}{\text{s}^2}$$

# Force

- The measure of the mass of an object coupled with it's acceleration.

$$F = ma$$

$$\text{Units} = \text{kg} \times \frac{\text{m}}{\text{s}^2}$$